

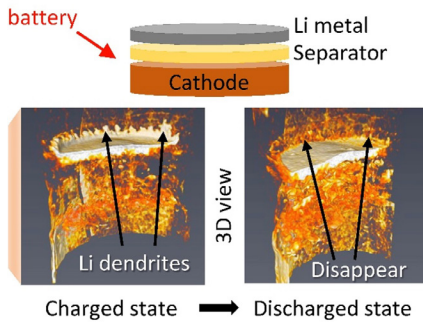
# Neutron Imaging Meets the 3-Source Strategy

## Advanced studies of battery defects and failure mechanisms

- Optimization of neutron imaging across our 3 sources enables real-time observation of how batteries break down during operation across a broad range of length scales
- Providing complete and unprecedented assessments of dynamic phenomena inside battery components

### HFIR:

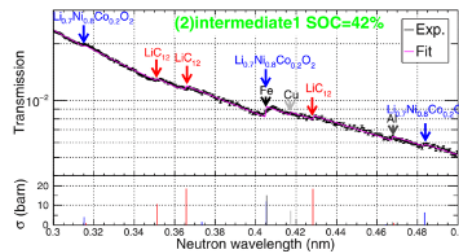
HFIR enables 3D tomography of charge-discharge processes captured during real-time battery cycling



Song et al, ACS Energy Letters, 2019.

### SNS:

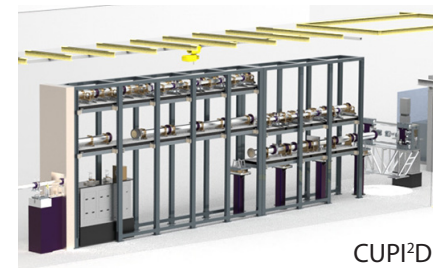
VENUS will leverage time-of-flight capabilities of the pulsed-beam accelerator for unique insights into phase transformation behaviors during cycling (via Bragg-edge imaging)



Kino et al, Solid State Ionics (2016).

### STS:

The high volume of specialized cold neutrons at STS will enable extraordinary kinetic measurements of combined phase and defects at the nanoscale



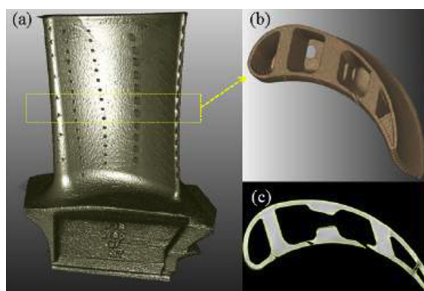
CUIP2D

## Neutron imaging reveals defects in Additively Manufactured (AM) alloys

- Complete structural and mechanical behavior analysis using our 3 neutron sources
- Bolsters advanced modeling performed in academia and industry

### HFIR:

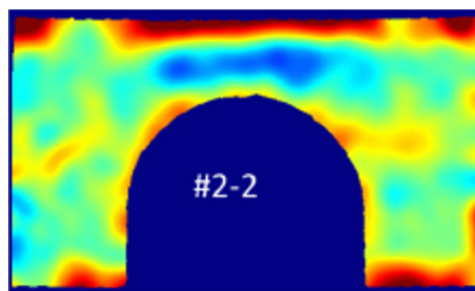
3D mapping of component structure and defects at 50 microns



Bilheux et al, AMP/ASNT, 2016.

### SNS:

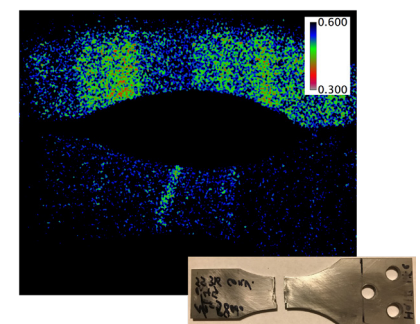
Strain mapping of thermal and mechanical stresses during slow processes in the tens-of-minutes range



Tremsin et al, Additive Manufacturing, 2021.

### STS:

Combined 3D mapping of strain and defects, from tens of nanometers to a few microns, all captured in less than 1 minute



Brooks et al., Materials and Design 140 (2019) 420-430.